ASTROPHYSICS

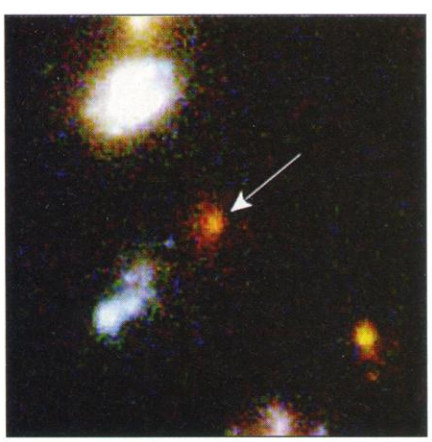
Farthest Supernova Yet Bolsters Dark Energy

If the idea that the universe is flying apart at ever-increasing speeds makes you seasick, better stock up on Dramamine. A star exploding in another galaxy has just given that theory a fresh boost.

Until recently, the queasy could hope that the evidence for the acceleration—the systematic dimming of distant supernovae—was really due to something else. Maybe intervening dust clouds were sopping up some of the light. Or maybe some quirk of cosmic evolution made ancient dying stars as different from today's supernovae as Donald Johanson is from the Lucy skeleton he found in Africa. One test could easily settle the issue: If dust or evolution were at work, more distant supernovae should become progressively fainter. If, however, unseen "dark energy" were pushing the universe apart, cosmologists predicted that the dimming with distance should eventually stop.

Now, through a combination of inspired detective work and plain old good luck, a team of astronomers led by Adam Riess of the Space Telescope Science Institute (STScI) in Baltimore has identified the most distant supernova ever. As Riess and colleagues announced on Monday at a press conference in Washington, D.C., supernova SN1997ff is so bright that it rules out both dust and evolution as explanations for the dimming, bolstering the case for dark energy.

"This is tantalizing evidence," says Robert Kennicutt, an astronomer at the University of Arizona in Tucson. "They have done a very careful job with both the measurement and the error analysis, and that is very important in this game."



Lucky star. Serendipitous images from Hubble's archives turned supernova SN1997ff into a "standard candle" that supports an accelerating universe.

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The game is dissecting the light of a special class of supernova called a type Ia. A type Ia supernova erupts when enough ambient gas falls back onto the snuffed-out core of an old star to raise the star's mass to 1.4 times the mass of the sun, making the star collapse and explode. Because they start with nearly the same amount of combustible fuel, all type Ia supernovae reach nearly the same peak brightness before fading. That allows astronomers to determine exactly how far away a supernova is: The fainter the measured peak, the farther away the supernova. "They are nature's cosmic mile markers," says Riess.

The color of a type Ia supernova also reveals how much the universe has grown since the star exploded. As the universe expands, the wavelength of light traveling through space also stretches by the same amount. Astronomers call this effect a redshift, because the increase in wavelength changes blue light to red. The more the universe has grown in the time it takes light from a distant supernova to reach Earth, the larger the redshift.

In the early 1990s, while assembling the redshifts and peak brightness of hundreds of supernovae, two international teams based at the Lawrence Berkeley National Laboratory in California and Mount Stromlo Observatory in Australia made a surprising discovery. At larger redshifts, type Ia supernovae become progressively fainter than predicted by the simplest model of a steadily expanding universe. "They are dimmer than we expect for a universe that is expanding at a constant rate or slowing down," says Saul Perlmutter, a leader of the Berkeley group. To explain the dim supernovae, both teams concluded that the expansion of the nearby universe has to be accelerating. And to drive the acceleration, the universe must be filled with dark energy.

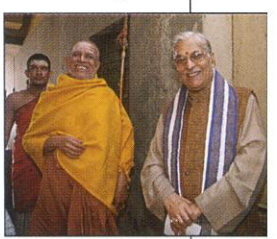
The hitch was that, on a cosmic scale, the supernovae astronomers had seen weren't very far away—merely a few billion light-years or so. As a result, the universe hadn't picked up enough speed since the stars exploded to make much difference in their brightness. "You could say, 'That's not very much,' " says cosmologist Michael Turner of the University of Chicago. " 'Maybe it's just dust blocking the light, or maybe supernovae are just dimmer in the early universe.' "

SN1997ff has dealt those ideas a potential death blow. When astronomers spotted it in a follow-up observation of the Hubble Deep Field in 1997, they knew it was far away. To tell how far, though, they needed the peak brightness—information that one image could not reveal. Digging in the Hubble Space Telescope archives, Riess and his collaborators spotted SN1997ff in the corner of a series of infrared images taken during an unrelated research project. "There were nearly 35 days of data in the archives," says

ScienceScope

Seeing Stars Indian scientists are dismayed by government plans to sanction Vedic astrology as an academic discipline. The University Grants Commission (UGC) is soliciting proposals from universities to "rejuvenate the science of Vedic astrology," which uses Hindu teachings and planetary alignments to plumb earthly events.

"Heaven knows we already have a surfeit of dross floating around our country," says Yash Pal, a retired astrophysicist and former chair of the UGC. "I hope no self-respecting university would ask to start such a department." Many believe that the directive comes at the behest of India's science and higher education minister, Murli Manohar Joshi (right, with Hindu priest). Joshi is a physicist and ardent student of ancient Indian texts.



UGC chair Hari Gautam defends the initiative, saying that it calls for "professional courses designed to produce certified professionals." He says that 70 to 80 universities have shown interest in starting the courses, which would begin in July.

Stem Cell Review Set In a move likely to fuel political tensions, the National Institutes of Health (NIH) this month will conduct its first ethical review of human pluripotent stem cell lines. The review, which will determine whether a researcher followed ethical guidelines in deriving the cell lines, is a key step toward winning government funding for research involving the cells (*Science*, 1 September 2000, p. 1442).

Many antiabortion groups, however, are pushing the Bush Administration to bar funding for such studies because the cells are derived from human embryos or fetal tissue. White House officials say they hope to decide the issue by early summer.

In the meantime, NIH is beginning to review proposals. Officials had hoped to begin in December, but no scientists submitted applications in time. At least three groups met a more recent deadline, NIH director Ruth Kirschstein told *Science* last week. NIH has not released their identities, but Martin Pera of Monash University in Melbourne, Australia, confirms that his team, which has developed several stem cell lines, is in the mix.

NIH's new Human Pluripotent Stem Cell Review Group (HPSCRG) will hold a public meeting on 25 April to review the applications. The agency plans to announce the meeting, and the names of HPSCRG members, on 10 April.

Riess. That was more than enough to show that SN1997ff was a type Ia supernova in a galaxy over 10 billion light-years away. And it was brighter than it would have been if either dust or evolution were responsible for the apparent dimming.

Does this supernova prove that the universe is filled with dark energy? Cosmologists say they would like to see a few more examples before they decide. "Extraordinary results require extraordinary scrutiny," Turner says. But at the least, the discovery of SN1997ff gives cosmologists a useful new tool. "The way to understand the nature of dark energy is by studying supernovae like this one," says Turner, "and this discovery shows that they are out there." **–MARK SINCELL**

Mark Sincell is a science writer in Houston.

VENICE PRESERVATION

Climate Change Data Prompt New Review

TRIESTE, ITALY—The Italian government has put another hurdle in the way of a controversial plan to control the flooding of Venice. Last month, the government sent the plan—which has been under development for almost 30 years—back for reworking under its water authority in Venice. The move leaves open the question of exactly what will be done.

On 15 March, the Council of Ministers agreed that the city's proposed $2 billion mobile floodgate scheme, called MOSE (Modulo Sperimentale Elettromeccanico, or experimental electromechanical module), should be reviewed once again to factor in potential rises in sea level caused by global climate change (*Science*, 25 August 2000, p. 1301). The ministers also directed that MOSE should be integrated with small-scale measures such as raising pavement levels.

The review is expected to begin immediately. But details remain unresolved, as does the role of the Consorzio Venezia Nuova, which has designed and assessed the project and is also expected to lead construction of the floodgates.

Willer Bordon, head of the Environment Ministry (which has opposed MOSE in its present form), emphasizes that the review is not a green light for MOSE itself. Nerio Nesi, head of the Ministry of Public Works—which has backed the project and will oversee the review—is more positive. "Venice needs [both] MOSE and the small-scale measures," he says. "The MOSE project only needs updating in view of the predicted changes in climate."

The idea for MOSE arose after a 2-meter flood in 1966. Its central feature is a system of inflatable mobile barriers that would close off the three lagoon outlets when tides exceed 1 meter. Planning began in the 1970s, and the project was finally endorsed in 1998 by the Veneto region, as well as an international panel. The ministries of environment and cultural heritage rejected the assessment, however, but the Veneto Court annulled their decree last July.

With two ministries warring over the project, the issue was handed over to the Council of Ministers to resolve. Last month's decision comes 10 weeks after a deadline set last year and 2 months before general elections.

Members of environmental groups, who say that MOSE could turn the ecosystem into a "stinking marsh," worry that projected global warming will exacerbate the problems by requiring greater use of the floodgates. Instead, they pin their hopes on such small-scale operations as raising pavement, which is already under way, and proposals to reconfigure the port outlets, strengthen the shorelines, and rebuild the quays. Officials for the Green Party say that such projects could reduce the effective tide level by up to 40 cm, safeguarding the lagoon for the next 50 years and permitting a reanalysis of MOSE that is based on more recent scientific findings.

Nesi says that the planning effort should be completed within "a few months." Bordon and the environmentalists hope for a formal reassessment of MOSE's environmental impact then, before the Council of Ministers takes final action. In the meantime, the European Community is looking into whether the Consorzio's role in the project represents an infraction of community regulations on open competition.

–SUSAN BIGGIN

Susan Biggin writes from Trieste, Italy.

Slogging along. The government orders another look at how best to keep Venetians high and dry.

BUSH APPOINTMENT

Venture Capitalist to Lead Science Panel

The Bush Administration has made its biggest science-related job appointment so far. President George W. Bush last week named Floyd Kvamme, a former computer industry executive and Republican stalwart, to lead his science advisory panel. The post of presidential science adviser, a full-time position typically held by a prominent scientist from academia, remains empty.

Insider. Floyd Kvamme is likely to have Bush's ear on S&T issues.

Kvamme, 62, is a partner in the California venture capital firm of Kleiner Perkins Caufield & Byers, which provided early backing for such prominent high-tech companies as Genentech and America Online. He becomes co-chair of the President's Committee of Advisors on Science and Technology (PCAST), a volunteer panel stocked with prominent researchers and industry chiefs whose other co-chair is the science adviser, who also heads the White House Office of Science and Technology Policy. PCAST meets periodically to offer its thoughts on hot science policy topics, although past presidents, including Bill Clinton, have paid scant attention to the group.

In naming Kvamme on 28 March, Bush said that "science and technology have never been more essential to the defense of the nation and the health of our economy." He called Kvamme "a risk taker" who "knows the players." Kvamme's background includes stints at computer giants Apple and National Semiconductor. He is an electrical engineer by training.

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